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(54) **WEB FOR DOWN PADDING, AND ULTRA-LIGHT DOWN PADDING WITH 4-WAY HIGH ELASTICITY AND HIGH INSULATION INCLUDING THE SAME**

(57) The present invention is an invention about ultra-light down padding and a web for down padding used in its manufacture, and relates to ultra-light down padding having a thin thickness, excellent insulation and excellent elasticity in 4-way (or multi-directions). The web com-

prises a mixed down containing at least one selected from goose down and duck down, non-stretchable low melting sheath-core composite fiber, hollow conjugate stretch (HCT) short fiber and regular solid siliconized (RSS) short fiber.

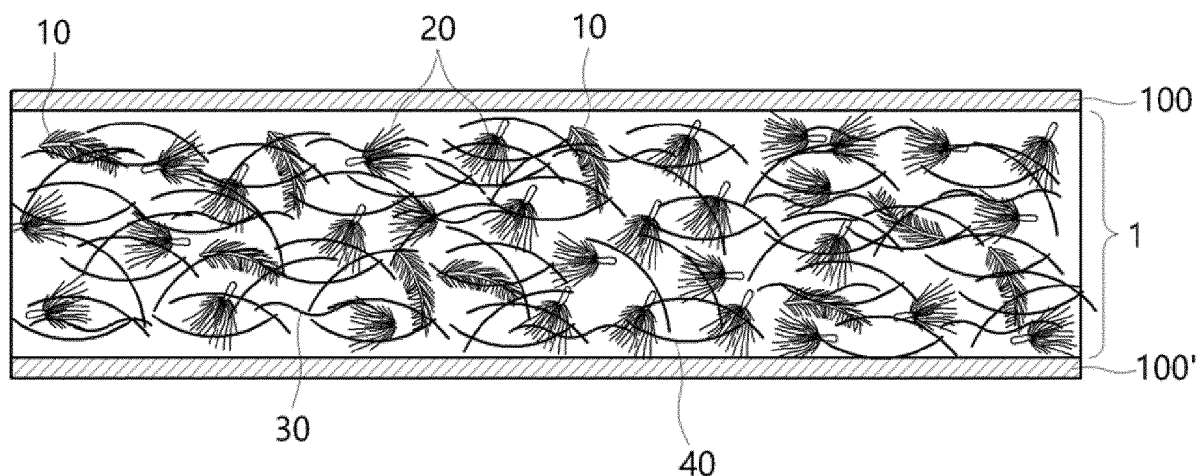


FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATION

5 **[0001]** This application claims priority to and the benefit of Korean Patent Application No. 10-2023-0103769, filed on August 08, 2023, the disclosure of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

10 **[0002]** The present invention relates to ultra-light down padding having a thin thickness, excellent insulation, and excellent elasticity in 4-way (or multi-directions), a web for down padding used for manufacturing the same, and a method for manufacturing the same.

BACKGROUND

15 **[0003]** Down products using duck down or goose down as winter clothing that can maintain body temperature during outdoor activities in winter have been preferred as high-end products in the market due to their excellent insulating power by containing a large amount of air between the downs.

20 **[0004]** As these down products emerge as the main items of winter fashion, the popularity of ultra-lightweight down jumpers, which are light and easy to carry, continues to increase, and accordingly, many developments are being made in relation to insulation and lightness.

25 **[0005]** However, in the case of down padding, downy hair lacks restoration and support powers, and hair loss caused by the down coming out along the seam line and the peculiar smell of down cause complaints about quality, as well as, poor product appearance and difficulty in washing due to hair clumping have been pointed out. In order to prevent hair loss and clumping of down products, by combining the core layer (web composed of down) and the lining of the down padding, cutting them into a structure having a plurality of compartments, or by combining the lining and outer fabric of down padding, cutting them into a structure having a plurality of compartments, and then filling the compartments with down to manufacture down padding, down padding was manufactured in a form in which down was filled inside a plurality of compartment structures, that is, in a form in which down was filled between seam lines (e.g., quilting structure, etc.), but
30 down padding of this structure has a problem in that a cold spot is generated and the insulating power is reduced.

[0006] In addition, the recent trends in apparel products are emphasizing activity as well as design, however, the down padding having the compartment structure as described above has poor elasticity and restoring force, and the thickness of the down padding is too thick to secure high insulating power and heat retention, so there was a problem that did not fit the recent fashion trend.

35 **[Related Art Document]**

[Patent Document]

40 **[0007]**

Korean Patent Registration No. 10-1334624 (registered 2013.11.25)

Korean Patent Registration No. 10-1669938 (registered 2016.10.21)

45 **SUMMARY OF THE INVENTION**

Technical Problem

50 **[0008]** The present invention is directed to providing a web for down padding having a composition optimized to make down padding integrated sheet type without formation of a compartment structure generating a cold spot and without needle punching, and greatly increase elasticity and recovery of down padding and have excellent thermal insulation, and an ultra-light down padding including the same as a filler (or a web layer).

Technical Solution

55 **[0009]** The web for down padding of the present invention for solving the above-described problems includes a mixed down containing at least one selected from goose down and duck down; non-stretchable low melting sheath-core composite fiber, HCT (Hollow Conjugate Stretch) short fiber, and RSS (Regular Solid Siliconized Fiber) short fiber.

[0010] In a preferred embodiment of the present invention, the mixed down includes 15 to 30% by weight of feathers and 70 to 85% by weight of down.

[0011] In a preferred embodiment of the present invention, a sheath part of the non-stretchable low melting sheath-core composite fiber has a melting point of 100 to 150 °C, and a core part thereof has a melting point of 250 °C or more.

[0012] In a preferred embodiment of the present invention, the non-stretchable low melting sheath-core composite fiber has an average fineness of 3.0 to 5.0 de and an average fiber length of 45 to 60 mm.

[0013] In a preferred embodiment of the present invention, each of the HCT short fiber and the RSS short fiber has a melting point of 260 °C or higher.

[0014] In a preferred embodiment of the present invention, the HCT short fiber has an average fineness of 2.0 to 3.5 de, an average fiber length of 45 to 60 mm, and a number of crimps of 15 to 23/inch.

[0015] In a preferred embodiment of the present invention, the RSS short fiber has an average fineness of 2.0 to 3.5 de and an average fiber length of 45 to 60 mm.

[0016] In a preferred embodiment of the present invention, the web for down padding of the present invention includes 25.0 to 50.0% by weight of the mixed down, 9.0 to 18.0% by weight of the HCT short fibers, 13.0 to 21.0% by weight of RSS short fibers, and the remaining amount of the non-stretchable low melting sheath-core composite fiber among 100% by weight.

[0017] In a preferred embodiment of the present invention, the web for down padding of the present invention may have a basis weight of 70 to 150 g/m².

[0018] Another aspect of the present invention relates to ultra-light down padding with 4-way high elasticity and high insulation, and the down padding includes a web layer composed of the web for down padding; and sheet layers laminated on the upper and lower parts of the web layer and combined with the web layer, described above.

[0019] In a preferred embodiment of the present invention, the down padding of the present invention is a composite sheet in which a web layer and a sheet layer are integrally combined without a compartment structure that cause cold spots and needle punching.

[0020] In a preferred embodiment of the present invention, the sheet layer may include a multidirectional stretchable fabric of a net structure woven with high elastic polyester yarn.

[0021] In a preferred embodiment of the present invention, an acrylic resin layer may be included between the web layer and the sheet layer.

[0022] In a preferred embodiment of the present invention, when a basis weight of the web layer of the present invention is 80 to 100 g/m², the insulating power measured according to the ASTM D1518 method may satisfy 2.00 CLO or more.

[0023] In a preferred embodiment of the present invention, when a basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the air permeability measured according to the ASTM D737 method may satisfy 100 CFM (cubic feet per minute) or more.

[0024] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the drying rate after 1 hour measured according to the JIS L 1096 method may satisfy 30.0% or more.

[0025] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the volume recovery rate may satisfy 83.0% or more.

[0026] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the residual extension rate after 30 seconds measured according to the ASTM D3107 method and calculated by Equation 2 may satisfy 6.5% or less in the length direction and 8.0% or less in the traverse direction.

[0027] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the residual extension rate after 30 minutes measured according to the ASTM D3107 method and calculated by Equation 2 may satisfy 3.0% or less in the length direction and 4.5% or less in the traverse direction.

[Equation 2]

$$\text{Residual Extension rate} = \text{growth rate (\%)} = \left[\frac{(\text{original length} + \text{unrecovered length}) - \text{original length}}{\text{original length}} \right] \times 100\%$$

[0028] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the recovery rate after 30 seconds measured according to the ASTM D3107 method and calculated by Equation 3 may satisfy 70.0% or more in the length direction and 65.0% or more in the traverse direction.

[0029] In a preferred embodiment of the present invention, when the basis weight of the web layer of the down padding of

the present invention is 80 to 100 g/m², the recovery rate after 30 minutes measured according to the ASTM D3107 method and calculated by Equation 3 may satisfy 75.0% or more in the length direction and 75.0% or more in the traverse direction.

[Equation 3]

$$\text{Recovery rate (\%)} = \frac{[(\text{maximum elongation length} - (\text{original length} + \text{unrecovered length})) / (\text{maximum elongation length} - \text{original length})] \times 100\%}{}$$

[0030] Another aspect of the present invention relates to a method for manufacturing the ultra-light down padding with 4-way high elasticity and high insulation, it can be manufactured by performing a process including a first step of supplying yarn in a bale state to a supply unit; a second step of performing bale breaking and opening processes on the yarn supplied to the supply unit, respectively; a third step of carding the opened yarn; a fourth step of processing and manufacturing the carded yarn into a web; a fifth step of performing a drying process after applying an acrylic resin to both surfaces of the web; and a sixth step of surface heat-treating the web to which the acrylic resin is fixed, laminating sheets on both surfaces of the web, rolling with a heating roll, and then packing.

Advantageous Effects

[0031] The down padding of the present invention is ultra-light down padding without cold spot, having excellent heat retention, thermal insulation, and excellent elasticity, and restoring force, and having very low shape deformability. In addition, the down padding of the present invention has excellent drying properties and no down separation compared to conventional down padding.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a schematic view of a cross-sectional structure of a down padding of the present invention.

FIG. 2 is a schematic view of a down padding manufacturing process of the present invention.

[0033] A and B of FIG. 3 are photographs of the down padding manufactured in Example 1.

[0034] FIG. 4 is a photograph of an apparatus used to measure the elasticity of Experimental Example 2.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] As used herein, the term "non-stretchable" means having a very low elongation and volume recovery rate, and refers to a characteristic in which the fiber does not return to its original shape after being stretched by an external force due to low elasticity.

[0036] As used herein, the term "4-way" means both directions in one direction in which the down padding is stretched and in both directions perpendicular thereto in a two-dimensional plane.

[0037] Hereinafter, the present invention will be described in more detail.

[0038] The web for down padding of the present invention is a web without cold spots, and is a web in the form of a sheet without a compartment structure and needle punching.

[0039] The web for down padding of the present invention may include a mixed down containing at least one selected from goose down and duck down; non-stretchable low melting sheath-core composite fiber, HCT (Hollow Conjugate Stretch) short fiber, and RSS (Regular Solid Siliconized Fiber) short fiber.

[0040] The mixed down includes at least one selected from goose down and duck down. In this case, the "mixed" of the mixed down does not mean a mixture of goose and/or duck down, but a mixture of feather and down.

[0041] And, the mixed down may include 15 to 30% by weight of feathers and 70 to 85% by weight of down, may preferably include 15 to 25% by weight of feathers and the remaining amount of down among 100% by weight, and may more preferably include 17.5 to 22.5% by weight of feathers and the remaining amount of down among 100% by weight. In this case, if the feather content is less than 15.0% by weight, there may be a problem in that the price competitiveness is greatly reduced because the down content is too high, and if the feather content exceeds 30.0% by weight, the insulation may be somewhat lowered, and there may be a problem with uneven product surfaces, and thus, considering insulation, marketability, etc., it is good to use feathers and down within the above range.

[0042] In addition, the non-stretchable low melting sheath-core composite fiber serves to bind mixed down and other fibers in the web and to stabilize the shape of the web, and is a fiber without stretchability (elasticity).

[0043] The sheath part of the non-stretchable low melting sheath-core composite fiber may be composed of PET (polyethylene terephthalate) resin having a melting point of 100 to 150 °C, preferably a melting point of 105 to 130 °C, more preferably a melting point of 105 to 120 °C. In addition, the core part of the non-stretchable low melting sheath-core composite fiber may be composed of PET resin having a melting point of 100 to 150 °C, preferably a melting point of 105 to 130 °C, more preferably a melting point of 250 °C or more, still more preferably a melting point of 250 to 280 °C, and yet still more preferably a melting point of 255 to 275 °C.

[0044] In this case, if the melting point of the resin for forming the sheath part is less than 100 °C, there may be a problem of poor fusion, and if the melting point of the resin for forming the sheath part exceeds 150 °C, there may be a problem that the product becomes hard. In addition, if the melting point of the resin forming the core part is less than 250 °C, there may be a problem of loosening the connection between the yarns, and if the melting point of the resin for forming the core part exceeds 280 °C, there may be a problem in that the connection between the yarns becomes hard and hardens.

[0045] And, as the non-stretchable low melting sheath-core composite fiber, those having an average fineness of 3.0 to 5.0 de and an average fiber length of 45 to 60 mm, preferably those having an average fineness of 3.5 to 4.7 de and an average fiber length of 45 to 58 mm, and more preferably having an average fineness of 3.7 to 4.5 de and an average fiber length of 48 to 55 mm may be used. In this case, if the average fineness of the non-stretchable low melting sheath-core composite fiber is less than 3.0 de, there may be a problem in that the thickness is lowered, and if the average fineness of the non-stretchable low melting sheath-core composite fiber exceeds 5.0 de, there may be a problem that the product does not feel soft. In addition, the average fiber length of the non-stretchable low melting sheath-core composite fiber is less than 45 mm, there may be a problem of poor coupling between yarns, and if the average fiber length exceeds 60.0 mm, there may be a problem that the yarn is tangled and the thickness is lowered.

[0046] Next, the RSS short fibers constituting the web serve to increase the strength, flexibility, and softness of the web, and fibers that have no heat fusion under the conditions of the web manufacturing process and the down padding process using the same. Therefore, the RSS short fiber is a fiber that satisfies the melting point of 260 °C or more, preferably 260 to 300 °C. In a preferred embodiment, silicone-coated polyester fibers may be used as the RSS short fibers to increase miscibility with other fibers, and in a preferred example, PET fibers coated by mixing 100% PET (polyethylene terephthalate) regular short fibers with aliphatic alcohol, phosphate mixture, and low molecular weight alcohol mixture silicone emulsion can be used as RSS short fibers.

[0047] In addition, as the RSS short fibers, those having an average fineness of 2.0 to 3.5 de, an average fiber length of 45 to 60 mm, and a number of crimps of 15 to 23/inch may be used, preferably those having an average fineness of 2.0 to 3.0 de, an average fiber length of 45 to 58 mm, and a number of crimps of 17 to 23/inch may be used, and more preferably those having an average fineness of 2.2 to 2.8 de, an average fiber length of 48 to 55 mm, and a number of crimps of 18 to 22/inch may be used. In this case, if the average fineness of the RSS short fibers is less than 2.0 de, there may be a problem in that the yarns do not bond well due to the lack of strength of the yarns, and if the average fineness of the non-stretchable RSS short fibers exceeds 3.0 de, there may be a problem in that the soft touch of the product is lowered. In addition, the average fiber length of the RSS short fibers is less than 45 mm, there may be a problem of poor coupling between yarns, and if the average fiber length exceeds 60.0 mm, there may be a problem that the yarn is tangled and the thickness is lowered. In addition, if the number of crimps of RSS short fibers is less than 15/inch, there may be a problem in that the restoring force is lowered, and if the number of crimps exceeds 13/inch, there may be a problem of low bonding strength between yarns.

[0048] Next, the HCT short fibers constituting the web serve to impart elasticity and restoring force to the web, and the HCT short fiber is a fiber that satisfies a melting point of 260 °C or higher, preferably a melting point of 265 °C or higher. In a preferred embodiment, the HCT short fibers may be polyester fibers satisfying the melting point, more preferably PET (polyethylene terephthalate) fibers.

[0049] And, as the HCT short fibers, those having an average fineness of 2.0 to 3.5 de and an average fiber length of 45 to 60 mm may be used, preferably those having an average fineness of 2.0 to 3.0 de and an average fiber length of 45 to 58 mm may be used, and more preferably those having an average fineness of 2.2 to 2.8 de and an average fiber length of 48 to 55 mm may be used. In this case, if the average fineness of the HCT short fibers is less than 2.0 de, there may be a problem of lowering elasticity, and if the average fineness of the non-stretchable HCT short fibers exceeds 3.0 de, there may be a problem of lowering restoring force after elasticity. In addition, the average fiber length of the HCT short fibers is less than 45 mm, there may be a problem of low bonding strength, and if the average fiber length exceeds 60.0 mm, there may be a problem that the yarn is tangled and the thickness is lowered.

[0050] The web for down padding of the present invention composed of the fibers described above may include 25.0 to 50.0% by weight of the mixed down, 9.0 to 18.0% by weight of the HCT short fibers, 13.0 to 21.0% by weight of RSS short fibers, and the remaining amount of the non-stretchable low melting sheath-core composite fiber among 100% by weight, preferably may include 28.0 to 45.0% by weight of the mixed down, 9.5 to 16.5% by weight of the HCT short fibers, 14.0 to 21.0% by weight of RSS short fibers, and the remaining amount of the non-stretchable low melting sheath-core composite fiber among 100% by weight, and more preferably may include 29.0 to 42.0% by weight of the mixed down, 9.8 to 16.3% by weight of the HCT short fibers, 14.0 to 20.5% by weight of RSS short fibers, and the remaining amount of the non-

stretchable low melting sheath-core composite fiber among 100% by weight. In this case, if the mixed down content in the web is less than 25% by weight, insulation may be insufficient, and if it exceeds 50% by weight, the content of other fibers is relatively reduced, which may be unsuitable for down padding with high elasticity and restoring force to be manufactured by applying the web. In addition, if the content of HCT short fibers in the web is less than 9% by weight, there may be problems such as poor stretchability and elasticity of the web, and even if it exceeds 18% by weight, there may be no further increase in stretchability, so it is good to use it within the above range. In addition, if the RSS short fiber content in the web is less than 13% by weight, the strength and flexibility of the web are too insufficient, and thus the marketability and processability may be deteriorated, and it used in excess of 22% by weight, the strength of the web is increased, but the insulation of the web may be relatively reduced, so it is recommended to use it within the above range.

[0051] It is preferable that the web for down padding (single-layer web and/or composite web) of the present invention has a basis weight of 70 to 150 g/m², preferably has a basis weight of 75 to 140 g/m², and more preferably has a basis weight of 78 to 135 g/m² in terms of securing physical properties such as thin characteristics, ultra-light weight, and high insulation of the down padding to which the web is applied.

[0052] Describing the ultra-light down padding with 4-way high elasticity and high insulation, as schematically shown in FIG. 1, the down padding of the present invention includes a web layer 1 composed of the web for down padding; and sheet layers 100 and 100' laminated on the upper and lower parts of the web layer and combined with the web layer, described above, and the web layer and the sheet layer are combined without a cold spot to form an integrated composite sheet.

[0053] In addition, an acrylic resin layer may be included between the web layer and the sheet layer.

[0054] In addition, the sheet layer may be a multidirectional stretchable fabric of a net structure woven with high elastic polyester yarn.

[0055] The down padding of the present invention can be manufactured through a process as shown in a schematic process diagram in FIG. 2. More specifically describing, it can be manufactured by performing a process including a first step of supplying yarn in a bale state to a supply unit; a second step of performing bale breaking and opening processes on the yarn supplied to the supply unit, respectively; a third step of carding the opened yarn; a fourth step of processing and manufacturing the carded yarn into a web; a fifth step of performing a drying process after applying an acrylic resin to both surfaces of the web; and a sixth step of surface heat-treating the web to which the acrylic resin is fixed, laminating sheets on both surfaces of the web, rolling with a heating roll, and then packing.

[0056] When the basis weight of the web layer of the down padding of the present invention described above is 80 to 100 g/m², the insulating power measured according to the ASTM D1518 method may satisfy 2.00 CLO or more, preferably 2.05 to 3.00 CLO, and more preferably 2.10 to 2.96 CLO.

[0057] In addition, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the air permeability measured according to the ASTM D737 method may satisfy 100.0 CFM (cubic feet per minute) or more, preferably 120.0 to 150.000 CFM, and more preferably 125.0 to 145.000 CFM.

[0058] In addition, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the drying rate after 1 hour measured according to the JIS L 1096 method may satisfy 30.0% or more, preferably 31.0 to 40.0%, and more preferably 31.0 to 38.5%.

[0059] In addition, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the volume recovery rate may satisfy 83.0% or more, preferably 85.0 to 92.0%, and more preferably 85.0 to 90.0%.

[0060] In addition, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the residual extension rate after 30 seconds measured according to the ASTM D3107 method and calculated by Equation 2 below may satisfy 6.5% or less in the length direction and 8.0% or less in the traverse direction, preferably 1.0 to 6.2% in the length direction and 3.0 to 7.0% in the traverse direction, and more preferably 1.4 to 6.0% in the length direction and 3.5 to 6.7% in the traverse direction.

[0061] In addition, when measuring the residual extension rate after 30 minutes in the same way, it may satisfy 5.0% or less in the length direction and 4.5% or less in the transverse direction, preferably 1.0 to 4.8% in the length direction and 1.2 to 4.5% in the transverse direction, and more preferably 1.0 to 4.5% in the length direction and 2.0 to 4.2% in the transverse direction.

[0062] In this case, the length direction refers to a warp yarn direction of the fabric constituting the down padding sheet layer, and the transverse direction refers to a weft yarn direction of the fabric constituting the down padding sheet layer.

[Equation 2]

$$\text{Residual Extension rate} = \text{growth rate (\%)} = \left[\frac{(\text{original length} + \text{unrecovered length}) - \text{original length}}{\text{original length}} \right] \times 100\%$$

[0063] In addition, when the basis weight of the web layer of the down padding of the present invention is 80 to 100 g/m², the recovery rate after 30 seconds measured according to the ASTM D3107 method and calculated by Equation 3 may

satisfy 70.0% or more in the length direction and 65.0% or more in the traverse direction, preferably 70.0 to 86.0% in the length direction and 65.0 to 80.0% in the traverse direction, and more preferably 65.0 to 85.0% in the length direction and 66.5 to 80.0% in the traverse direction.

[0064] In addition, when measuring the recovery rate after 30 minutes in the same way, it may satisfy 75.0% or more in the length direction and 75.0% or more in the transverse direction, preferably 76.0 to 90.0% in the length direction and 76.5 to 87.5% in the transverse direction, and more preferably 77.5 to 89.0% in the length direction and 77.0 to 87.0% in the transverse direction.

[0065] In this case, the length direction refers to a warp yarn direction of the fabric constituting the down padding sheet layer, and the transverse direction refers to a weft yarn direction of the fabric constituting the down padding sheet layer.

[Equation 3]

$$\text{Recovery rate (\%)} = \frac{[\{\text{maximum elongation length} - (\text{original length} + \text{unrecovered length})\}}{(\text{maximum elongation length} - \text{original length})} \times 100\%$$

[0066] Hereinafter, the present invention will be described in more detail through the following examples, but the following examples are not intended to limit the scope of the present invention, which should be construed to aid understanding of the present invention.

[Examples]

Example 1: Manufacturing of down padding

[0067] A mixed down containing 20% by weight of baled duck feathers and 80% by weight of duck down was prepared.

[0068] A non-stretchable low melting sheath-core composite fiber having an average fineness of 4 de and an average fiber length of 51 mm was prepared (manufacturer: Huvis, product name: LMF). In this case, the composite fiber is a fiber in which the sheath part is composed of polyethylene terephthalate resin having a melting point of 110 °C and the core part is composed of PET resin having a melting point of 250 °C, and the cross-sectional area ratio of the core part and the sheath part is 1:1.

[0069] As RSS (Regular Solid Siliconized Fiber) short fibers, silicone-coated PET (Polyethylene terephthalate) fibers (manufacturer: Huvis, product name: Regular short fibers) having a melting point of 260 °C or higher were prepared. The RSS fiber had an average fineness of 2.5 de and an average fiber length of 51 mm.

[0070] As HCT (Hollow Conjugate Stretch) short fibers, PET fibers (manufacturer: Huvis, product name: ZENTRA) having a melting point of 260 °C or higher were prepared. The HCT fiber had an average fineness of 2.5 de and an average fiber length of 51 mm.

[0071] Down padding was manufactured through a process schematically shown in FIG. 2 by supplying the mixed down, non-stretchable low melting sheath-core composite fiber, RSS short fiber, and HCT short fiber as yarn.

[0072] By supplying the yarn to a supply unit, bale breaking and opening processes were performed.

[0073] Next, the opened yarn was transferred to a carding machine and subjected to carding.

[0074] Next, the carded yarn was transferred to a web forming unit and processed to form a web to prepare a web.

[0075] Next, the web was transferred to a drying unit, an acrylic resin (manufacturer: WOLSUNG VINA, product name: MEDIUM RESIN) was spray-coated on one surface of the web, and then primary drying was performed, and then acrylic resin was spray-coated on the other surface of the web, and then secondary drying was performed to fix the acrylic resin to the upper and lower parts of the web. In this case, the drying temperature was 145 °C to 155 °C, and the two spray coatings and the first and second drying are continuous processes.

[0076] Next, the web on which the acrylic resin layer is formed was transferred to a heat treatment unit and subjected to surface heat treatment at 310 °C to 350 °C, and then transferred to a sheet supply unit and a multidirectional stretchable fabric (manufacturer: Chargeurs PCC, product name: #6029) of a net structure woven with high elastic polyester yarn was laminated on both upper and lower surfaces of the web.

[0077] Next, it was compressed and integrated with a heating roll, and then packed to manufacture an integral composite sheet type down padding.

[0078] The manufactured down padding is composed of a single-layer web and an integrated sheet layer laminated and combined on the upper and lower parts of the web, and pictures of the manufactured down padding are shown in A and B of FIG. 3.

[0079] In addition, the web was composed of 30% by weight of mixed down, 17% by weight of HCT short fibers, 17% by weight of RSS short fibers, and 36% by weight of non-stretchable low melting sheath-core composite fibers, and had a basis weight of 100 g/m².

<Examples 2 to 6 and Comparative Examples 1 to 6>

[0080] Down padding was manufactured in the same manner as in Example 1, but the content or basis weight of the fibers in the web was varied as shown in Table 1 below, and Examples 2 to 5 and Comparative Examples 1 to 6 were respectively performed.

[0081] However, in the case of Examples 3 to 6 and Comparative Examples 1 to 6, as a multidirectional stretchable fabric constituting the sheet layer formed on both upper and lower surfaces of the down padding web, down padding was manufactured using the stretchable fabric (manufacturer: Picardie, product name: 6029) instead of the stretchable fabric of Example 1 (manufacturer: Wonyoung, product name: J30G) and the stretchable fabric of Example 2 (manufacturer: Sejin, product name: 3015F).

[Table 1]

Classification (wt.%)	Mixed down	HCT short fiber	RSS short fiber	Non-stretchable low melting sheath-core composite fiber	Nonwoven fabric Basis weight (g/m ²)
Example 1	30	17	17	36	100
Example 2	40	10	20	30	80
Example 3	40	10	20	30	80
Example 4	40	12	18	30	80
Example 5	40	18	12	30	80
Example 6	40	15	15	30	140
Comparative Example 1	40	8	22	30	80
Comparative Example 2	40	20	10	30	80
Comparative Example 3	23	18	18	41	80
Comparative Example 4	52	13	13	22	80
Comparative Example 5	40	15	15	30	65
Comparative Example 6	40	15	15	30	160

Experimental Example 1: Measurement of insulation, quick-drying, air permeability, hair loss, and recovery

[0082] Insulation, quick-drying, air permeability and hair loss evaluation experiments of the down padding prepared in the above Examples and Comparative Examples were conducted by requesting Intertek Testing Services Korea Ltd and IDFL Laboratory and Institute.

[0083] In addition, control group 1 is down padding with a basis weight of 80 g/m² including 50 wt.% of mixed down containing 20 wt.% of duck down feathers and 80 wt.% of duck down hair, 35 wt.% of sorona fiber, and 15 wt.% of PET fiber.

[0084] In addition, control group 2 is down padding with a basis weight of 80 g/m² including 85 wt.% of mixed down containing 20 wt.% of duck down feathers and 80 wt.% of duck down hair, and 15 wt.% of polyester fiber.

[0085] In addition, control group 3 is down padding (product name: syncloud basic GRS) with a basis weight of 80 g/m² composed of 100% polyester.

(1) How to measure insulation

[0086] The test method was measured in accordance with ASTM D1518, and the specific test method is as follows.

1) A hood was placed on the bare plate (heating element, set at 35 °C), and the environmental temperature of the chamber was set at 20 °C and humidity at 65%.

2) When the heat exchange between the environmental temperature and humidity and the bare plate was stabilized, the insulating power (Rct0) of the bare plate was measured.

3) The test piece was placed on the bare plate so that no wrinkles or tension were applied, and steps 1) to 2) were performed in order. In this case, the test piece was in a mock-up or sheet type padding state, and the size was 550 mm × 550 mm in width and length.

4) When heat exchange between the environmental temperature and humidity, the plate, and the test piece were

stabilized, the insulating power (Rct) of the test piece was measured.

5) The result value of insulating power (CLO) = $(R_{ct} - R_{ct0}) \times 6.45$ can be obtained.

[0087] The insulating power of 1 CLO is a unit representing heat resistance, and refers to a state of warmth in which people can feel comfortable, dissipating heat of 58 W/m² when the wind speed is 0.1 m/s and the ambient temperature is 21 °C. 1 CLO is equivalent to 0.155K m²/W.

[0088] The insulation measurement results are shown in Table 2 below, and the higher the CLO value, which is a unit representing insulation, means the better the insulation.

(2) How to measure quick-drying

[0089] The test method was measured in accordance with JIS L 1096:2010, and the specific test method is as follows.

- 1) Prepare a mock-up test piece with dimensions of 400 mm×400 mm in width and length.
- 2) The test piece was sufficiently absorbed in distilled water at 20 °C (± 2 °C).
- 3) Take it out of the water and mount it on the equipment when water droplets stop falling.
- 4) It was left in the test room in a standard state and the time until it was naturally dried and returned to its original weight was measured, the average value was expressed in integer digits, and the dried ratio (%) and complete drying time after 1 hour were measured.

(3) How to measure air permeability

[0090] The test method was measured in accordance with ASTM D737, and the specific test method is as follows.

- 1) After conditioning, proceed with equipment calibration.
- 2) After confirming that "0" dl is measured with the reference material, mount the test piece on a test piece platform so that there are no wrinkles or folds. In this case, the down padding itself was used as the test piece, and the size was 550 mm×550 mm in width and length.
- 3) The measured results were recorded, and the average value obtained by repeating the test 10 times was used as the measured value. In addition, the measurement was performed with the test area (Test area: 38 cm²) and the test pressure (Test pressure: 125 pa), which are the standards of the Americas.

(4) How to measure hair loss

[0091] The test method was measured in accordance with the FED STD FTMS 5530 International Method (International Method, based on the Federal Standard 191-5530), and less than 5 hair loss is acceptable. As for the test conditions, the size of the tumbling box was 45 cm×45 cm×45 cm (width, length, height), and RPM (revolution per minute) 48 (± 2) and the tumbling time (Duration of Tumbling) was set to 30 minutes.

(5) How to measure restorability

[0092] Restorability was measured in the following way.

- 1) Prepare a test piece for restoring force.
- 2) After placing the test piece flat, measure the height (Hb) in units of 1 mm before starting.
- 3) Leave it in a constant temperature and humidity room and place a 1 kg weight on it for 1 minute.
- 4) Remove the weight and measure the height (Ha) after a recovery time of 1 minute.
- 5) Calculate the restored ratio as a percentage using Equation 1 below.

[Equation 1]

$$\text{Volume recovery rate (\%)} = H_a / H_b \times 100\%$$

[Table 2]

Classification (°C)	Insulation (CLO)	Quick-drying		Air permeability CFM (Cubic feet per minute)	Hair loss (count)	Volume recovery rate
		Drying rate after 1 hour	Complete drying time			
Control group 1	1.62	29.4%	510 minutes	113.8	0	66.1%
Control group 2	2.54	38.8%	340 minutes	92.5	0	84.9%
Control group 3	1.60	34.0%	335 minutes	165.6	0	92.4%
Example 1	2.55	36.4%	350 minutes	138.5	0	86.5%
Example 2	2.17	31.3%	460 minutes	133.1	0	86.7%
Example 3	2.94	36.6%	345 minutes	140.2	0	88.9%
Example 4	2.65	36.2%	355 minutes	104.5	0	85.2%
Example 5	2.71	36.8%	350 minutes	108.3	0	83.5%
Example 6	2.88	30.9%	370 minutes	127.0	0	83.1%
Comparative Example 1	2.65	35.6%	350 minutes	116.4	0	71.0%
Comparative Example 2	2.34	37.4%	335 minutes	138.6	0	79.4%
Comparative Example 3	1.83	38.2%	340 minutes	146.8	0	89.3%
Comparative Example 4	3.12	30.3%	425 minutes	96.0	2	69.3%
Comparative Example 5	1.78	37.8%	325 minutes	144.7	0	90.1%
Comparative Example 6	3.27	24.6%	480 minutes	90.7	0	78.3%

[0093] Looking at the physical property measurement results in Table 2, the down paddings of Examples 1 to 6 had insulation of 2.00 CLO or more, air permeability of 100 CFM or more, and good quick-drying of 30% or more, but no hair loss. In addition, it was confirmed that the down paddings of Examples 1 to 6 had an excellent volume recovery rate of 83.0% or more.

[0094] On the other hand, in the case of Comparative Example 1 using a small amount of HCT short fibers, compared to Examples 2 and 3, there was a problem in that the volume recovery rate was slightly lowered. And, in the case of Comparative Example 2 using HCT short fibers in excess of 18% by weight, physical properties such as insulation, quick-drying, and air permeability were good, but compared to Examples 2 and 3, there was a problem in that the volume recovery rate decreased rapidly.

[0095] In the case of Comparative Example 3, in which the mixed down content was used too little, such as 25% by weight, other physical properties were good, but there was a problem in that the insulation was relatively less than 2.0 CLO.

[0096] In the case of Comparative Example 4 in which the amount of sheath-core composite fiber was relatively small due to the excessive use of mixed down, unlike other Examples and Comparative Examples in which there was no problem with hair loss, there was a problem in that hair loss occurred, and there was a problem in that the quick-drying was reduced and the volume recovery rate was greatly reduced.

[0097] In the case of Comparative Example 5 having a basis weight of the web layer of 65 g/m², physical properties such as insulation, quick-drying, and air permeability were good, but there was a problem in that the insulation was less than 2.00 CLO and insufficient, and in the case of Comparative Example 6 having a basis weight of the web layer of 160 g/m², the insulation was very good, but there was a problem that the quick-drying and air permeability were relatively poor, and the volume recovery rate was less than 80% and insufficient.

Experimental Example 2: Measurement of elasticity

[0098] In the elasticity test, a high value of elongation is interpreted as an excellent product, but it is also a test that can confirm that durability and appearance are well maintained by considering the values of elongation and recovery. In general, the smaller the residual extension rate (or growth rate, non-recovered part) and the larger the recovery rate, the better the performance.

[0099] The elasticity was measured according to the ASTM D3107 method, the specific measurement method is as follows, and a photograph of the device used in the test is shown in FIG. 4.

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1) 6 samples with a size of 2.5 inches $\times$ 22 inches (width, length) with the length direction parallel to the stretch direction were taken, and an equal number of fibers were unwound from both sides of the test piece to make them in a width of 2.00 (± 0.05) inches.

2) Fold the lengthwise end of the test piece for stretching to about 1.25 inches, stitch the 1-inch part, and spread it out on a flat surface for 30 minutes without external force.

3) The test piece was allowed to stand for 4 hours under standard conditions of 21(± 1) °C and 65(± 2)% RH.

4) Make a benchmark in the center of the test piece (minimum length: 10 (± 0.05) inches).

5) Hang one of both ends of the sewn loop-type test piece on the upper clamp, measure the length of the benchmarked part of the test piece, and record it in units of 1 mm.

6) Insert a dowel pin into the loop at the bottom of the test piece and hang a weight of 4 lbs or 3 lbs.

7) Cycle three times so that a load of 0 to 4 lbs (3 lbs) can be applied to the test piece.

8) Measure the degree of stretch after 10 seconds or 30 minutes.

9) Using the clamp of the tension meter, stretch it to a length (H) of 85% of the calculated stretch percentage and fix it.

10) After fixing it in a stretched state for 30 minutes, remove the test piece from the lower clamp.

11) Measure the benchmark according to each Client Time Option for the test piece from which the load is removed, and record it in units of 1 mm.

[0100] Residual Extension rate or growth rate was calculated based on Equation 2, recovery rate was calculated by Equation 3, and stretch percentage was calculated by Equation 4.

[Equation 2]

$$\text{Residual Extension rate} = \text{growth rate (\%)} = \left[\frac{\{(\text{original length} + \text{unrecovered length}) - \text{original length}\}}{\text{original length}} \right] \times 100\%$$

[Equation 3]

$$\text{Recovery rate (\%)} = \left[\frac{\{\text{maximum elongation length} - (\text{original length} + \text{unrecovered length})\}}{\{\text{maximum elongation length} - \text{original length}\}} \right] \times 100\%$$

[Equation 4]

$$\text{Stretch percentage (or elongation, \%)} = \left[\frac{\{\text{maximum elongation length}\} - \text{original length}}{\text{original length}} \right] \times 100\%$$

[0101] In Table 3 below, the length direction refers to a warp yarn direction of the fabric constituting the down padding sheet layer, and the transverse direction refers to a weft yarn direction of the fabric constituting the down padding sheet layer. In addition, the physical property measurement values in Table 3 show the average value of the values measured by performing three times.

[Table 3]

Classification		Control group 1	Control group 2	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6
Residual extension rate after 30 seconds (%)	Length	2.0	4.4	2.4	1.6	1.3	1.9	4.6	5.2
	Transverse	2.8	7.2	5.2	4.4	4.0	4.3	5.4	6.5

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(continued)

Classification		Contr ol group 1	Contr ol group 2	Exempl e 1	Exempl e 2	Exempl e 3	Exempl e 4	Exempl e 5	Examp le 6
5	Residual extension rate after 30 minutes (%)	Length	1.6	3.2	1.6	1.2	1.0	2.2	3.1
		Travers e	2.0	4.8	3.6	3.2	3.0	3.9	4.2
10	After ap- plying ten- sion, stretch per- centag e at 30 minutes (%)	Length	8.8	16.4	17.6	14.4	18.2	17.9	16.8
		Travers e	12.4	18.4	27.2	17.2	20.1	19.8	17.9
15	Recovery rate after 30 seconds (%)	Length	73.7	68.6	83.8	71.4	84.2	79.5	77.8
		Travers e	73.1	33.8	77.6	70.3	78.3	74.5	73.1
20	Recovery rate after 30 minutes (%)	Length	78.9	77.1	89.2	78.6	89.5	84.4	80.2
		Travers e	80.8	69.2	84.5	78.4	86.7	82.6	78.5
25		Length	79.8	77.4	89.2	78.6	89.5	84.4	80.2
		Travers e	77.4	69.2	84.5	78.4	86.7	82.6	78.5

[Table 4]

Classification		Comparati ve Example 1	Comparati ve Example 2	Comparati ve Example 3	Comparati ve Example 4	Comparati ve Example 5	Comparati ve Example 6
30	Residual extension rate after 30 seconds (%)	Length	7.5	8.2	8.4	4.8	2.1
		Travers e	8.8	9.6	8.2	5.0	4.6
35	Residual extension rate after 30 minutes (%)	Length	4.2	4.5	4.7	3.3	1.2
		Travers e	5.6	5.2	6.3	4.7	2.4
40	After apply- ing tension, stretch per- centa ge at 30 minutes (%)	Length	23.6	19.8	13.5	13.4	18.5
		Travers e	30.9	25.3	17.8	20.7	24.9
45	Recovery rate after 30 seconds (%)	Length	60.8	77.0	64.0	67.7	80.7
		Travers e	62.6	65.8	67.6	67.1	77.4
50	Recovery rate after 30 minutes (%)	Length	54.6	62.4	60.1	74.8	83.5
		Travers e	58.3	70.5	68.5	70.2	80.1

[0102] Looking at Tables 3 and 4, it was confirmed that the down padding of the present invention, Examples 1 to 6, had a low residual extension rate and a high recovery rate overall, and through this, it was confirmed that the product had high elasticity.

[0103] In contrast, in the case of Comparative Example 1 using less than 9% by weight of HCT short fibers and more than 21% by weight of RSS short fibers, there was a problem that the residual extension rate was low and the recovery rate was greatly reduced.

[0104] In addition, in the case of Comparative Example 2 using more than 18% by weight of HCT short fibers and less than 13% by weight of RSS short fibers, there was a problem of low recovery rate while having a high residual extension rate compared to Example 5.

[0105] And, in the case of Comparative Example 3 using a small amount of mixed down, as confirmed in Experimental Example 1, the insulation was not good, and the residual extension rate and recovery rate showed poor results, which is judged to be the result of the relatively excessive use of the non-stretchable sheath-core composite fiber. On the other hand, in the case of Comparative Example 4, when compared to Example 6, it was confirmed that the insulation was very good, but there was a problem that the residual extension rate was somewhat high and the recovery rate was relatively low.

[0106] In addition, in the case of Comparative Example 5 having a basis weight of the nonwoven fabric of 65 g/m², residual extension rate and recovery rate were good, but as confirmed in Experimental Example 1 above, there was a problem with poor insulation, and in the case of Comparative Example 5 having a basis weight of the nonwoven fabric of 160 g/m², when compared to Example 6, there was a problem in that the residual extension rate was low, but the recovery rate was greatly reduced.

[0107] Through the above Examples and Experimental Examples, it was confirmed that the down padding of the present invention has excellent insulation even in a low basis weight range and excellent elasticity in 4-way (or multi-directions), and it was confirmed that the down padding of the present invention can provide an ultra-light and functional down padding product.

<Description of Symbols>

[0108]

1:	web (layer) for down padding	100, 100':	sheet layer
10:	feather	20:	down
30:	RSS short fiber	40:	HCT short fiber

Claims

1. A web for down padding, comprising:

a mixed down containing at least one selected from goose down and duck down;
non-stretchable low melting sheath-core composite fiber;
HCT (Hollow Conjugate Stretch) short fiber; and
RSS (Regular Solid Siliconized Fiber) short fiber.

2. The web for down padding of claim 1, wherein:

a sheath part of the non-stretchable low melting sheath-core composite fiber has a melting point of 100 to 150 °C, and a core part thereof has a melting point of 250 °C or more, and
the HCT short fiber and the RSS short fiber have a melting point of 260 °C or higher.

3. The web for down padding of claim 1, wherein the mixed down comprises 15 to 30% by weight of feathers and 70 to 85% by weight of down.

4. The web for down padding of claim 1, wherein:

the non-stretchable low melting sheath-core composite fiber has an average fineness of 3.0 to 5.0 de and an average fiber length of 45 to 60 mm,
the HCT short fiber has an average fineness of 2.0 to 3.5 de, an average fiber length of 45 to 60 mm, and a number of crimps of 15 to 23/inch, and

the RSS short fiber has an average fineness of 2.0 to 3.5 de and an average fiber length of 45 to 60 mm.

5 5. The web for down padding of claim 1, comprising 25.0 to 50.0% by weight of the mixed down, 9.0 to 18.0% by weight of the HCT short fibers, 13.0 to 21.0% by weight of RSS short fibers, and the remaining amount of the non-stretchable low melting sheath-core composite fiber among 100% by weight.

6. The web for down padding of claims 1, wherein the web for down padding has a basis weight of 70 to 150 g/m².

10 7. An ultra-light down padding with 4-way high elasticity and high insulation, the ultra-light down padding comprising:

a web layer composed of the web for down padding of claim 6; and
sheet layers laminated on the upper and lower parts of the web layer and combined with the web layer,
wherein the sheet layer comprises a multidirectional stretchable fabric of a net structure woven with high elastic
polyester yarn, and

15 the web layer and the sheet layer are combined without a cold spot to form an integrated composite sheet.

8. The ultra-light down padding with 4-way high elasticity and high insulation of claim 7, comprising an acrylic resin layer between the web layer and the sheet layer.

20 9. The ultra-light down padding with 4-way high elasticity and high insulation of claim 7, wherein:

when a basis weight of the web layer is 80 to 100 g/m²,
an insulating power measured according to the ASTM D1518 method satisfies 2.00 CLO or more, and
an air permeability measured according to the ASTM D737 method satisfies 100 CFM (cubic feet per minute) or
25 more.

10. The ultra-light down padding with 4-way high elasticity and high insulation of claim 7, wherein:

30 when a basis weight of the web layer is 80 to 100 g/m²,
a drying rate after 1 hour measured according to the JIS L 1096 method satisfies 30.0% or more, and
a volume recovery rate satisfies 83.0% or more.

11. The ultra-light down padding with 4-way high elasticity and high insulation of claim 7, wherein:

35 when a basis weight of the web layer is 80 to 100 g/m²,
a residual extension rate after 30 seconds measured according to the ASTM D3107 method and calculated by
Equation 2 below satisfies 6.5% or less in the length direction and 8.0% or less in the traverse direction,
a recovery rate after 30 seconds measured according to the ASTM D3107 method and calculated by Equation 3
satisfies 70.0% or more in the length direction and 65.0% or more in the traverse direction:

40 [Equation 2]

Residual Extension rate = growth rate (%) = [(original length + unrecovered length) -
45 original length]/original length] × 100%

[Equation 3]

50 Recovery rate (%) = [(maximum elongation length - (original length + unrecovered
length))/(maximum elongation length - original length)] × 100%.

12. A method for manufacturing an ultra-light down padding with 4-way high elasticity and high insulation, the method
55 comprises performing a process comprising:

a first step of supplying yarn in a bale state to a supply unit;
a second step of performing bale breaking and opening processes on the yarn supplied to the supply unit,
respectively;

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a third step of carding the opened yarn;

a fourth step of processing and manufacturing the carded yarn into a web;

a fifth step of performing a drying process after applying an acrylic resin to both surfaces of the web; and

a sixth step of surface heat-treating the web to which the acrylic resin is fixed, laminating sheets on both surfaces of the web, rolling with a heating roll, and then packing.

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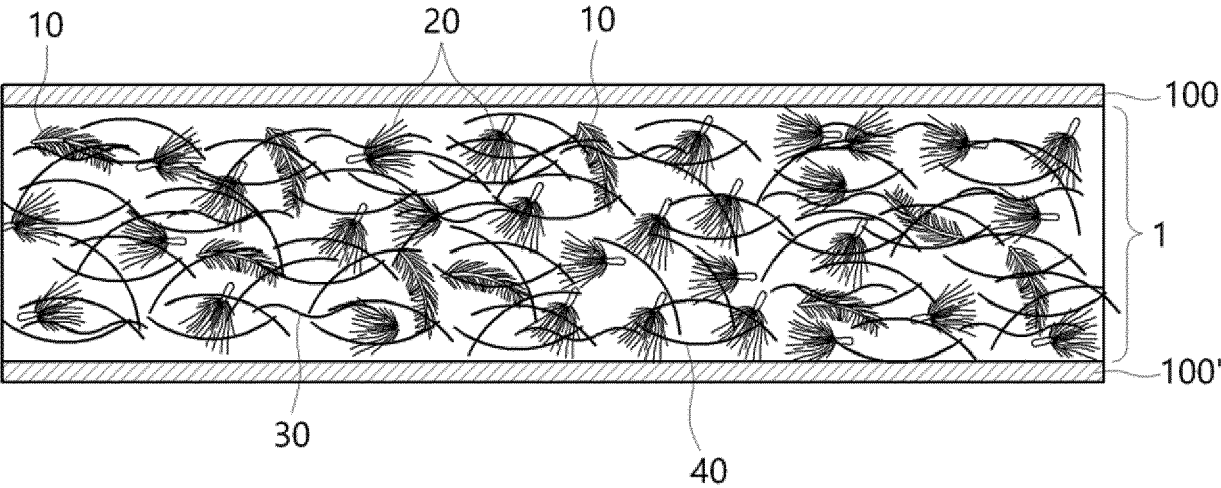


FIG. 1

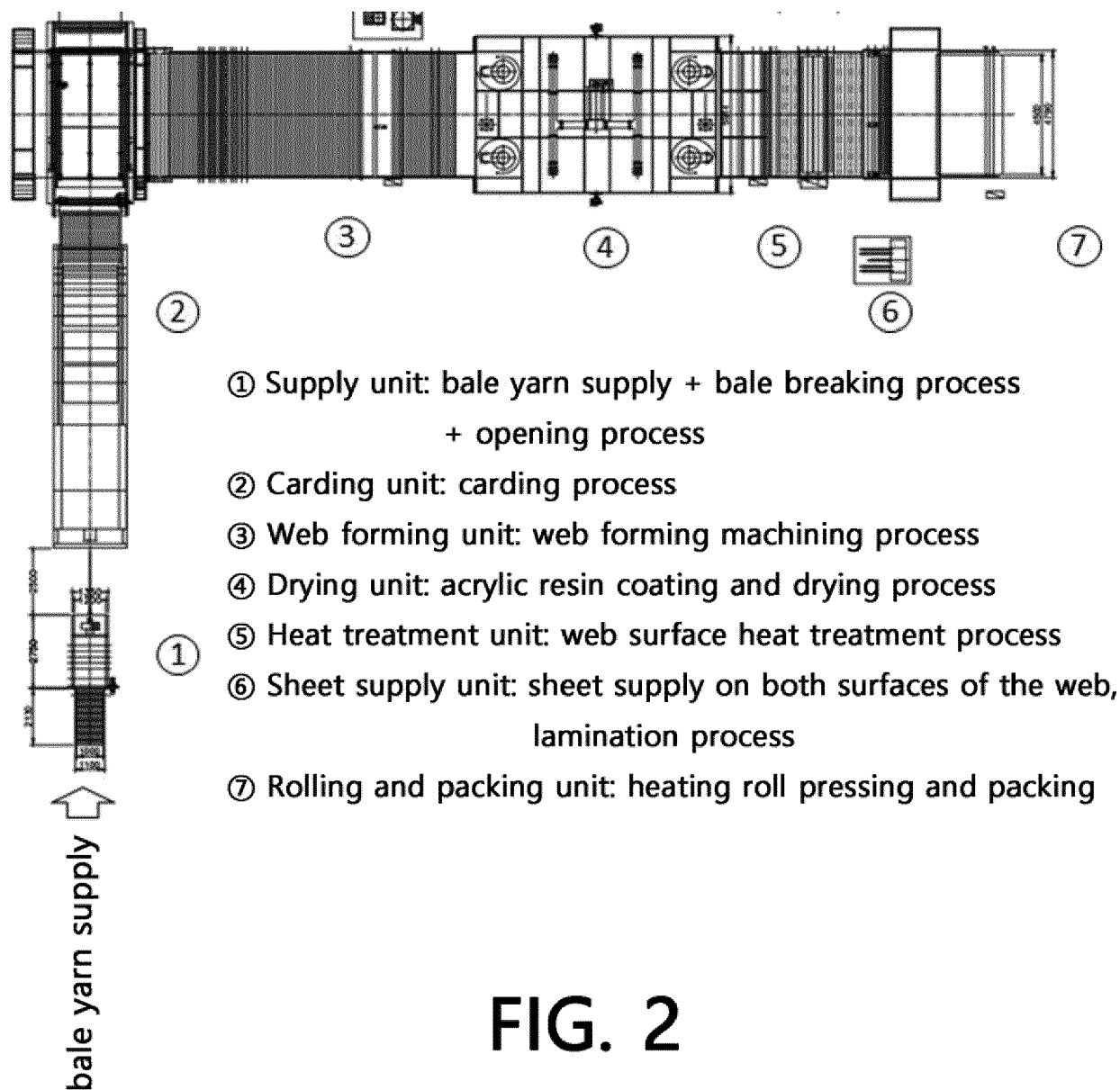


FIG. 2

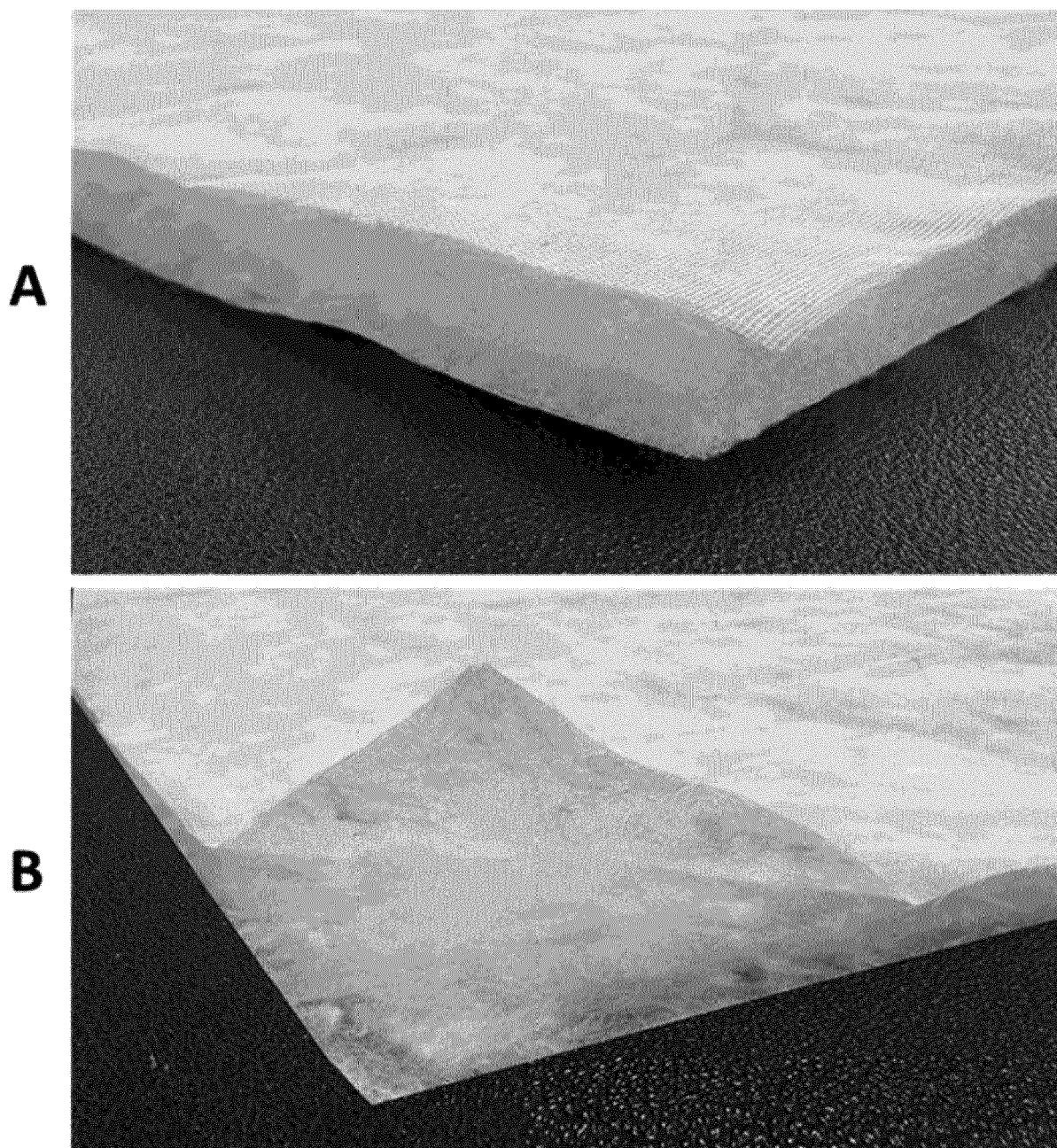


FIG. 3

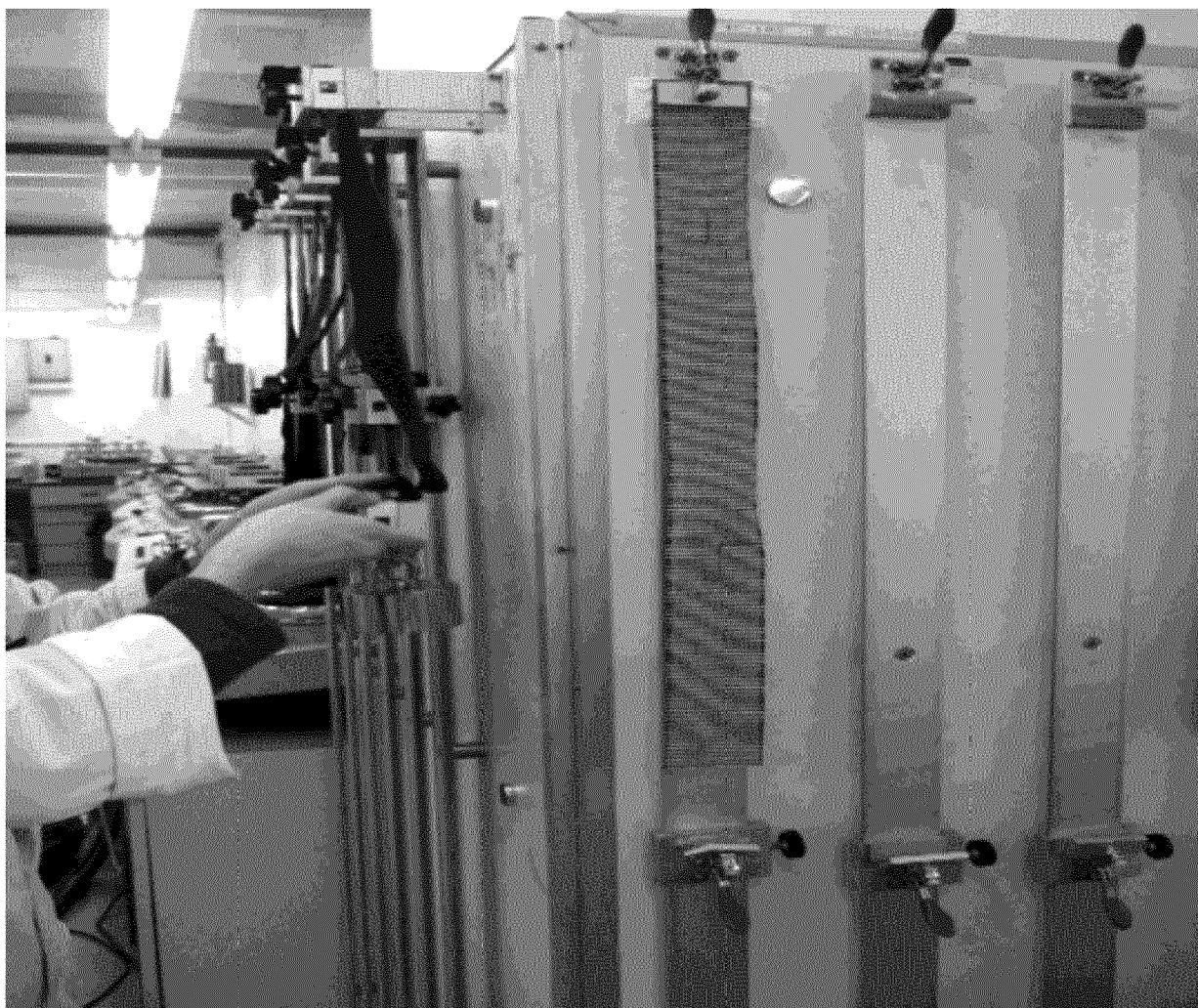


FIG. 4



EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2022/177969 A1 (PRIMALOFT INC [US]) 25 August 2022 (2022-08-25)	1-11	INV. D04H1/02
A	* paragraph [0071]; claims 1, 22, 23; figures 3C-3F *	12	D04H1/4266 D04H1/435 D04H1/4382
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A	GB 2 024 280 A (WARNACO INC) 9 January 1980 (1980-01-09) * example 1 *	1-12	ADD. A41D31/00 A41D31/02 A41D31/06
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A	* examples *	1-11	
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A	* example 1 *	1-11	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 June 2024	Examiner Saunders, Thomas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)



Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-11

A web for down padding, comprising:
a mixed down containing at least one selected from goose
down and duck down;
non-stretchable low melting sheath-core composite fiber;
HCT short fiber; and
RSS short fiber.

2. claim: 12

A method for manufacturing an ultra-light down padding with
4-way high elasticity and high insulation, comprising:
a first step of supplying yarn in a bale state to a supply
unit;
a second step of performing bale breaking and opening
processes on the yarn supplied to the supply unit,
respectively;
a third step of carding the opened yarn;
a fourth step of processing and manufacturing the carded
yarn into a web;
a fifth step of performing a drying process after applying
an acrylic resin to both surfaces of the web; and
a sixth step of surface heat-treating the web to which the
acrylic resin is fixed, laminating sheets on both surfaces
of the web, rolling with a heating roll, and then packing.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-06-2024

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